Nomenclator: Descriptive Directory Services for Large, Heterogeneous Networks

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DESCRIPTIVE DIRECTORY SERVICE

Locates people, resources, and information by describing their attributes

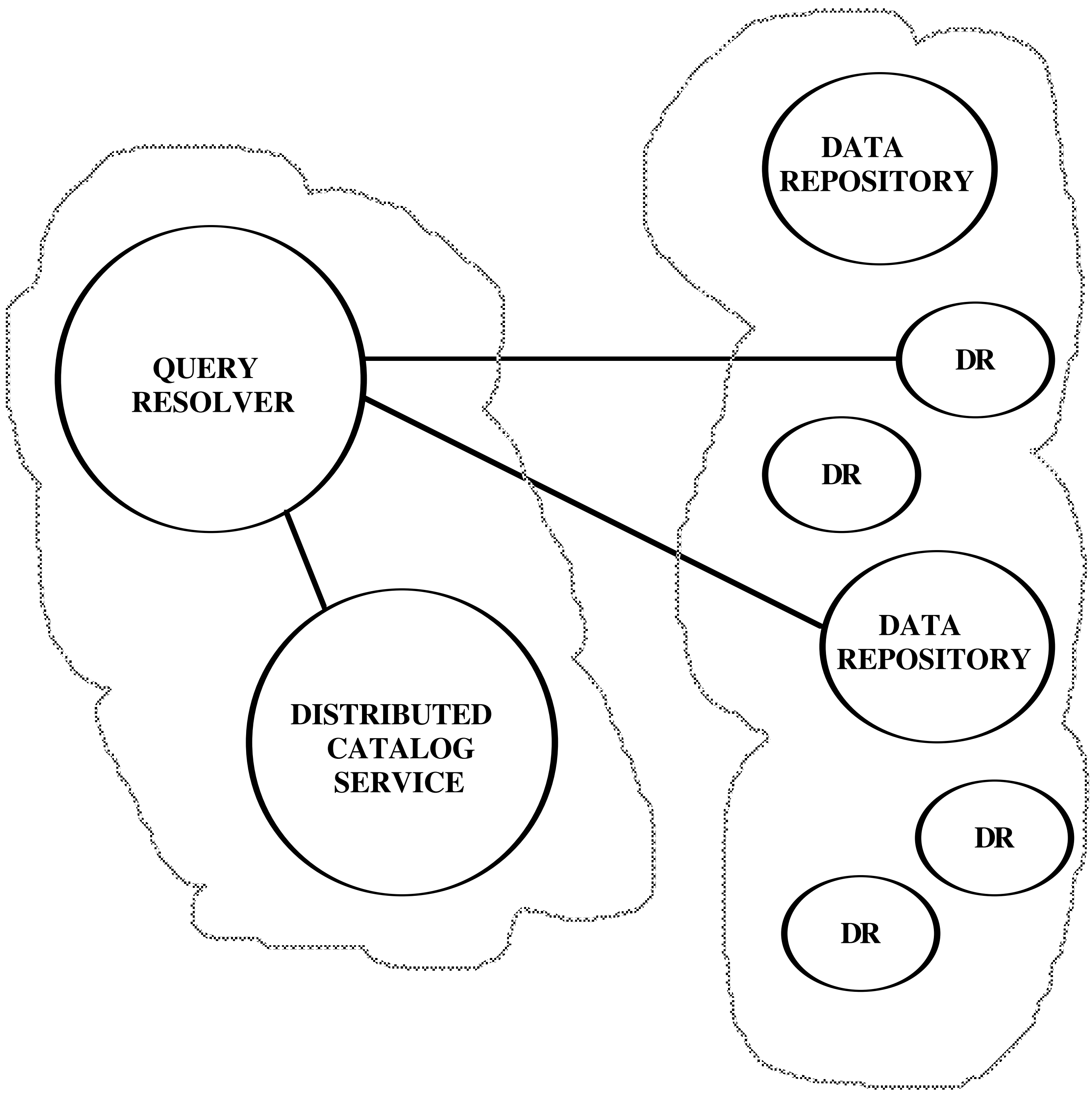
```
select * from People
   where
      name = "Ordille" and
      country = "US"
```

DESCRIPTIVE INFORMATION SERVICE

NOMENCLATOR GOALS

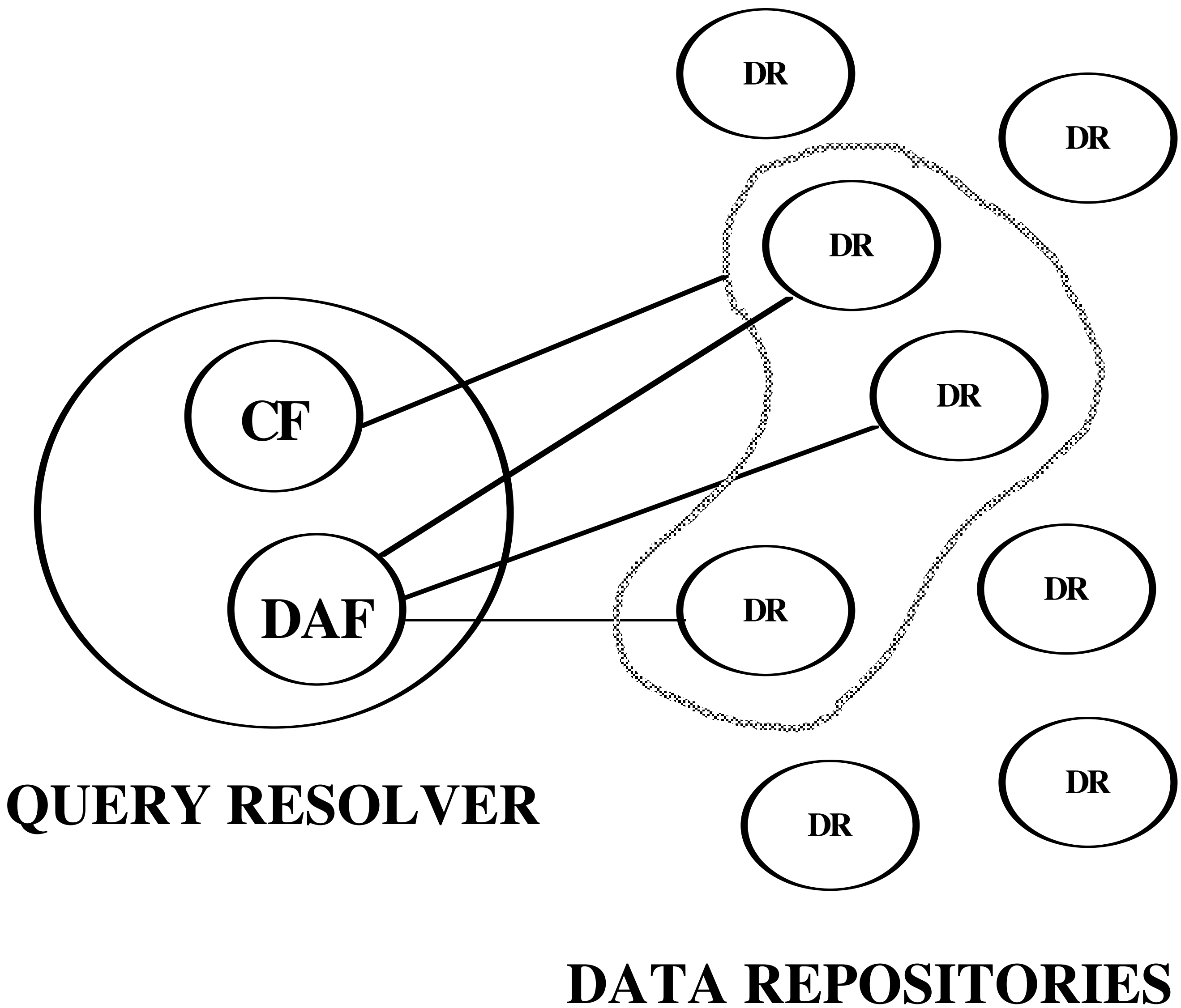
- **FAST Descriptive Directory Service for Large Internets**
  - **Scale**
    - **constraining the search space**
    - **meta-data and data caching**
  - **Autonomy**
    - **one relational interface to a variety of different data sources**
  - **Unavailability**
    - **advice and feedback**

NOMENCLATOR SYSTEM ARCHITECTURE



ACTIVE CATALOG

- Catalog Functions for Locating Data
- Data Access Functions for Obtaining Data



REFERRALS

TEMPLATE	CATALOG OR DATA ACCESS FUNCTION

IF QUERY -> TEMPLATE

THEN catalog or data access functions can be used to answer QUERY

- Improves Performance
  - Tailors query resolver to user needs
  - Combined through intersection and union
  - Cached and re-used
- Integrates catalog functions (indices) from different sources into one, distributed index

EXAMPLE OF REFERRALS FOR X.500

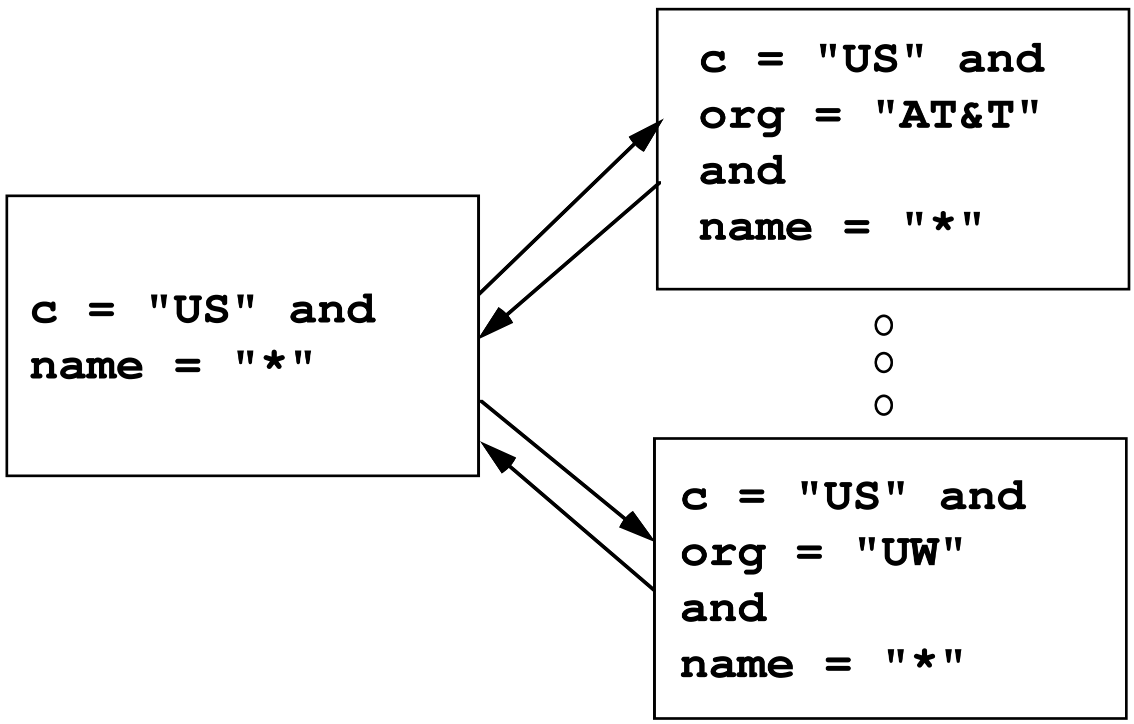
```
select * from People
   where
      name = "Ordille" and
      country = "US"
```

name = "*" and country = "US"	US_Names Catalog Function

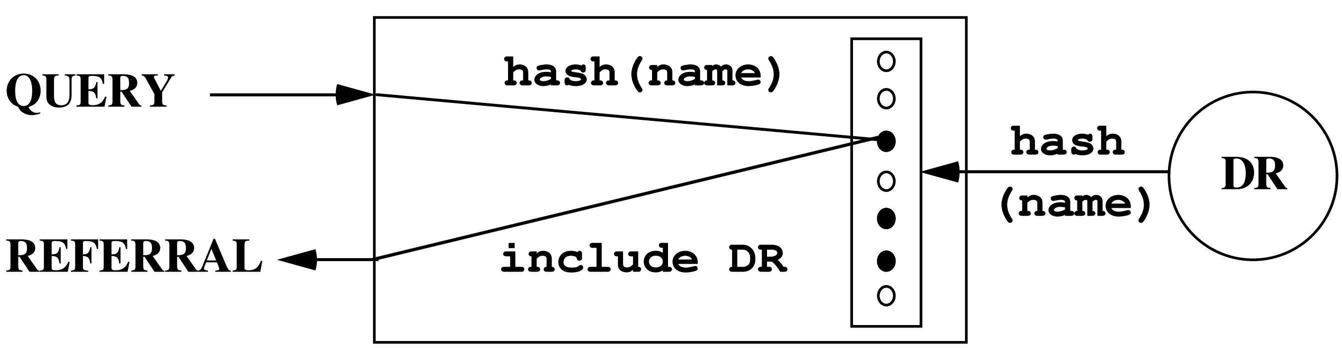
name ="Ordille" and country = "US"	X.500 Data Access Function and UW X.500 DSA Address

EXAMPLE OF CATALOG FUNCTION TECHNIQUES

Catalog Function DAGs



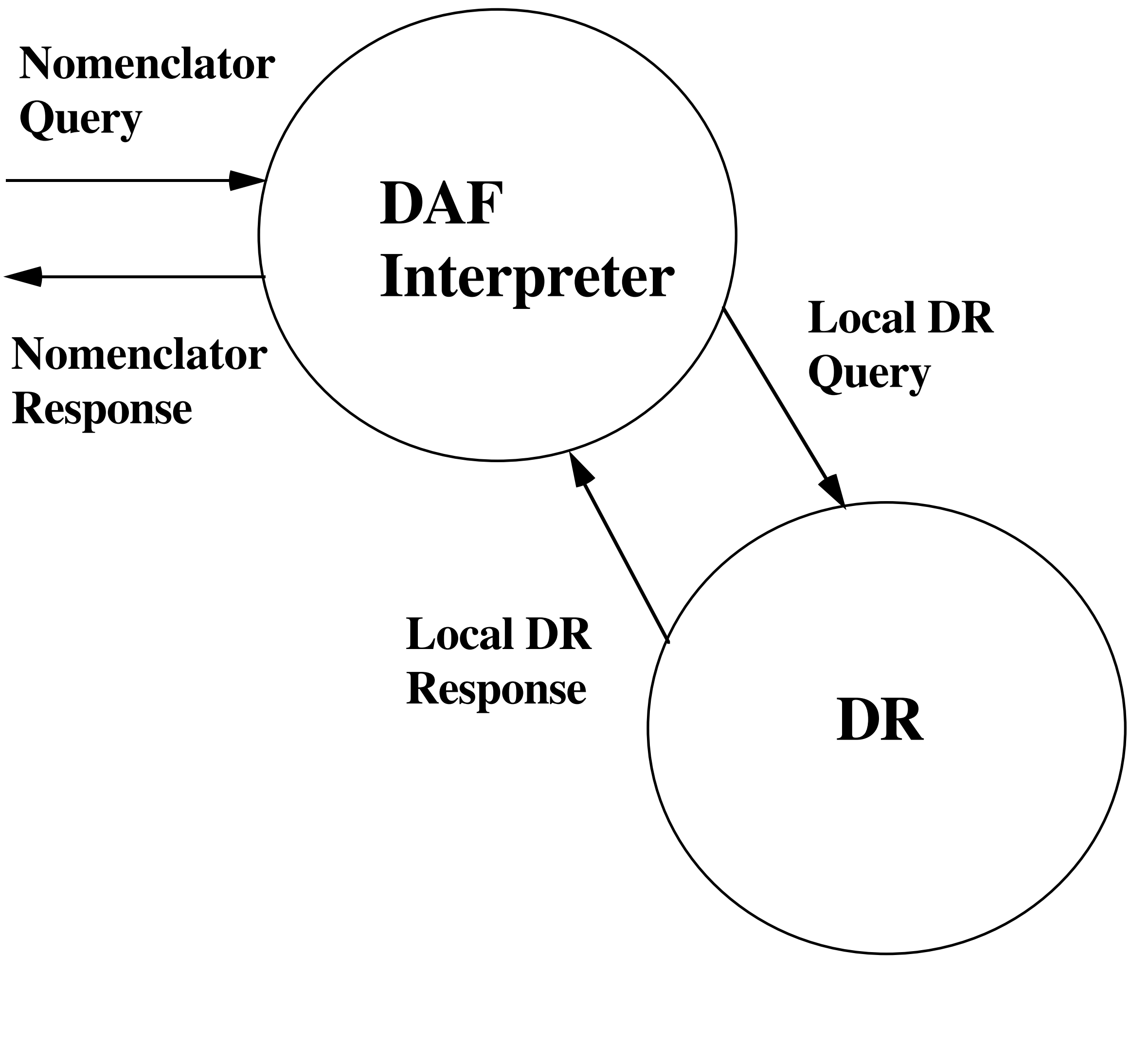
Catalog Functions with Bit Vector Filters



EXAMPLE DATA ACCESS FUNCTION TECHNIQUES
CCSO Name Services

- **200+ Servers**
- **20+ Countries**
- **People, Departments, Weather**
- **Relational Style**
- **Word-Based Matching/Indexing**

EXAMPLE DATA ACCESS FUNCTION TECHNIQUES
CCSO Name Services DAF



EXAMPLE DATA ACCESS FUNCTION TECHNIQUES
CCSO Name Services DAF

- Protocol Translation
- Schema Translation
    - Schema Divergence
    - Data Owners Specify Local to Global Mapping
    - Generate a Translation Program for DAF Interpreter

CACHING

- Meta-Data Caching
  - Referrals
  - Catalog Functions
  - Data Access Functions

- Data Caching

IF NEW QUERY -> OLD QUERY

THEN answer NEW QUERY from cached result of OLD QUERY

PERFORMANCE RESULTS OVERVIEW

- X.500 Experimental Results
  - Constrain Real Search Spaces

- Single User Experimental Results
  - Single User, 1000 Data Repositories
  - Catalog Functions - Biggest Contribution to Improved Response Time
  - Meta-Data Caches Reduce Network Load

- Analytical Model Results
  - Multi-User Workloads
  - Catalog Functions and Meta-Data Caching Improve Scale

SUMMARY

- Scale
    - Catalog Functions
    - Meta-Data Caching
    - Data Caching

- Heterogeneous Data Sources
    - Data Access Functions
    - Schema Translation Language

- Integrated Directory Service or Enhancement to Existing Information Service

- Will Be Available through the InterNIC

MORE INFORMATION

- Anonymous ftp to grilled.cs.wisc.edu
  - ordille_thesis.ps.Z
  - active_catalogs.ps.Z
  - db_challenge.ps.Z
  - sigcomm91.ps.Z
  - labyrinth.ps.Z
- Email nomenclator@research.att.com
  - Volunteer a CCSO site for the pilot
  - Volunteer a user site for the pilot
  - Ask questions